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What are landraces?

The case of sorghum in a Duupa village (northern Cameroon)

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1. Objective :

What are landraces ? Landraces result from an **evolutionary process** linked both to **farmers practices** and **evolutionary forces**. Previous studies have analysed the genetic diversity at a large scale but this does not allow for the study of interactions between farmers practices and evolutionary forces. Here we present the study of the organization of genetic diversity of sorghum landraces within a **traditional agrosystem** in a single village.

2. Introduction :

Our study was conducted in the village of **Wanté** among the **Duupa farmers** in subsahelian northern Cameroon. Sorghum cultivation is central to Duupa agriculture and society. Farmers cultivated **46 landraces** over the village with an average of **12 landraces per field**. Landraces present **large morphological and taxonomic diversity and variable uses**. Farmers have dynamic practices : they frequently change the location of their fields and they choose which landraces they will cultivate.

Sorghum bicolor ssp *bicolor*

- Wind-pollinated annual crop
- Selfing crop: up to 30% of outcrossing for guinea race
- Taxonomy : 5 races: caudatum, durra, kafir bicolor, and guinea and 10 intermediates

Evolutionary forces

- Selection
- Drift
- Mutation

Farmers practices

- Seed exchange : at many social occasions
- Sowing practices : landraces mixed in a common bowl before sowing

Selection of panicle : at harvesting and threshing time

What results for the genetic diversity and the genetic structure of landraces ?

3. Materiel and methods :

Plant material and microsatellite markers :
21 landraces (numbered L1 to L21) defined by farmers and belonging to different races genotyped for **14 microsatellite loci.**

Analyses of diversity and population structure :
- Number of alleles, observed heterozygosity, **gene diversity**
- **Fis, AMOVA, AFTD** (factorial analysis based on matrix distance)

4. Results & Discussion

- On average **Expected heterozygosity** is 0.32, and ranges from 0.30 (L16) to 0.47 (L21)

  Great genetic diversity

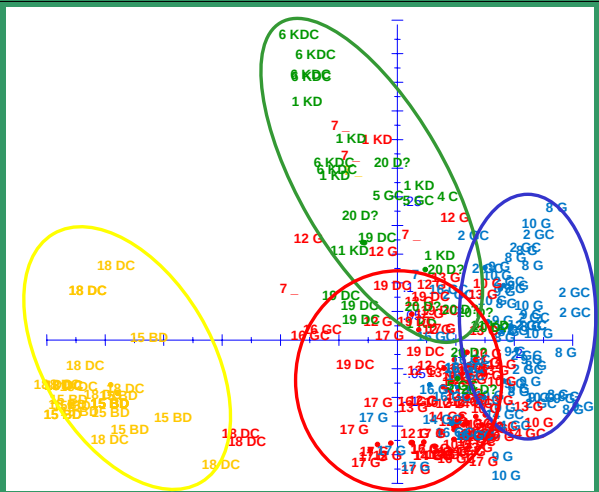
- 21% of the alleles are **private alleles**, number of private alleles ranges from 0 to 5 (L1)

- **Fis** values vary broadly from 0.53 to 0.85 [0.53 < Fis < 0.66 (L15, L16, L20, L21) ; Fis > 0.70 (L8, L9, L10, L12, L13, L14)]

  The level of selfing exhibits great variation among landraces

- **4 clusters :**
  1. **2 landraces** : yatta (L18) and see goorya (L15)
  2. Intermediates of **durra and kafir landraces**
  3. **Guinea landraces** mainly with white seed
  4. **Guinea landraces** mainly with red seed

- 35% of the variation is among clusters and **44% within landraces**



AFTD based on 14 SSRs among sorghum plants. Individuals are identified by the number of their landraces and by their race (G: guinea, C: caudatum, D: durra, K: kafir, B: bicolor)

5. Conclusion :

Despite the great morphological diversity of the 21 landraces analyzed, our results show four major clusters based on genetic data. This suggests that despite large gene flow, farmers maintained morphological identity of landraces by selection.